DOCUMENT RESUME

ED 223 648 TM 820 730

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| TITLE | Assessment of Intercoder Reliability on the Classification of Secondary School Courses. |
| INSTITUTION | Evaluation Technologies, Inc., Arlington, Va. |
| SPONS AGENCY | National Center for Education Statistics (ED), Washington, DC. |
| PUB DATE | 23 Jun 82 |
| CONTRACT | 300-81-0312 |
| NOTE | 44p.; Small print in Appendix D. |
| PUB TYPE | Reports - Research/Technical (143) |
| EDRS PRICE | MF01/PC02 Plus Postage. |
| DESCRIPTORS | *Academic Records; *Codification; *Course Descriptions; Reliability; Secondary Education; *Standards; Statistical Studies; Task Analysis; Training |
| IDENTIFIERS | *Classification of Secondary School Courses; High School and Beyond (NCES); *Inter Rater Reliability |

ABSTRACT

The Classification of Secondary School Courses (CSSC) is a coding activity to translate the diverse course titles which appear on transcripts and master schedules of students into common terms, permitting meaningful comparisons to be made about these students and allowing secondary school coursework to be considered as a coherent factor in statistical studies. The CSSC facilitates this task by aggregating under a unique main course title all similar course titles and assigning each main title a unique six-digit code. A test of intercoder reliability was designed, conducted and analyzed to test the usefulness of the CSSC as a coding tool and develop recommendations on coder training and the coding task. This report summarizes the following activities integral to the test: (1) coder selection and training; (2) training methodology; and (3) coding task and analysis results. While there is a fair amount of variability in the coding, there are a number of straight-forward ways to reduce it and achieve nearly perfect codings. Some of these techniques involve training enhancements (e.g., expanding the cross-reference list) and some involve procedural approaches (e.g., using multiple coders). (Author/PN)

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# ASSESSMENT OF INTERCODER RELIABILITY ON THE CLASSIFICATION OF SECONDARY SCHOOL COURSES

Prepared for:

U.S. Department of Education
National Center for Education Statistics
Contract Number 300-81-0312

TM 820 730

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June 23, 1982

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# I. INTRODUCTION

The Classification of Secondary School Courses (CSSC) was developed by Evaluation Technologies Incorporated for the National Center for Education Statistics (NCES) under contract number 300-81-0312. It will be used in the coding of transcripts of a national sample of high school students as part of the High School and Beyond longitudinal study. The goal of the NCES coding activity is to translate the diverse course titles which appear on transcripts and master schedules of students in the study into common terms permitting meaningful comparisons to be made about these students and allowing secondary school coursework to be considered as a coherent factor in statistical studies.

The CSSC facilitates this task by aggregating under a unique main course title all similar course titles and assigning each main title a unique six-digit code. Coders will be able to identify program areas and individual courses within them by matching course titles from student data with the codes and titles in the CSSC. The CSSC six-digit code is based on the structure of the Classification of Instructional Programs (CIP).[1] The first four digits correspond to the two-and four-digit program areas in the CIP. The last two digits represent unique courses.

To test the usefulness of the CSSC as a coding tool and develop recommendations on coder training and the coding task, ETI designed, conducted, and analyzed a test of intercoder reliability. This report summarizes the following activities integral to the test:

- Coder selection and training
- Training methodology
- Coding task and analysis results.

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[1] Malitz, Gerald S. A Classification of Instructional Programs. U.S. Department of Education, Office of Education Research and Improvement, National Center for Education Statistics, NCES 81-323, Washington, D.C.: U.S. Government Printing Office, 1981.

## II. METHODOLGY

### A. CODER SELECTION

Three coders and one alternate were selected for the reliability study. The alternate was included in case one of the other coders failed to complete the two-week study. All four coders met the criteria of having an American high school diploma and a minimum of two full years of college education. All coders were temporary employees: three were from Potomac Temporaries of Arlington, Virginia, and were public school teachers during the academic year; one was a temporary summer employee of Evaluation Technologies Incorporated who was a fulltime undergraduate student during the remainder of the year. The following chart describes the four coders:

| Coder | Age | Education | Occupation | Sex |
|---|---|---|---|---|
| 1 | 27 | B.A. | High School History Teacher | F |
| 2 | 25 | B.A. | Elementary School Teacher | F |
| 3 | 20 | 2 yrs of college | Student | M |
| 4 | 32 | M. Ed. Education | High School Social Studies Teacher | M |

Coder number 4 was randomly selected to be the alternate. None of the coders were informed that only three sets of data would be used until after all of them had completed the coding. The coders were paid by the hour.

### B. TRAINING

#### 1. Training Materials

The materials used during the training session included:

- The Training Outline - See Appendix A
- A Classification of Secondary School Courses, Final Draft, June 18, 1982
- Training protocols with sample course titles for practice coding - See Appendix B
- Catalogs corresponding to the training protocols
- Reminder list of special instructions - See Appendix C
- Diagram "Making a Coding Decision" - See Appendix D

2. Training Procedures

The coders were trained on the first day in an eight-hour training session on how to assign six-digit codes to secondary course titles using the CSSC.

The training session began with a 30-minute introduction to the training session, the test, and the intended use of the CSSC in the NCES High School and Beyond longitudinal study. The next 30 minutes continued with a page-by-page review of the CSSC, highlighting each section as to information included, such as, the alphabetical index and the short Table of Cross References and the main body of six-digit coded courses. After a 15-minute break, the coders were introduced to a sample protocol for practice in assigning the six-digit codes, the 50 secondary school catalogs to be used as the source of the courses, and the coding procedure. The coding procedure consisted of the coder entering his/her name, the start time, a six-digit code drawn from the CSSC, a check mark noting any reference to catalogs, and the finish time. The coders were asked to maintain the order of the protocols and refrain from discussing coding decisions among themselves, and to complete the protocol on which they were working before taking a break or leaving for the day. Coders were given guidelines for coding tracked and leveled courses. After the lunch break, the coders spent the remaining four hours on three increasingly difficult practice trials and reviewed their coding decisions and problems in a group with the trainers.

## C. TEST OF THE CSSC

The coding of the titles included in the test of the CSSC began on the day following the training session.

### 1. Materials

The coders used the final draft of the CSSC (A Classification of Secondary School Courses, Final Draft, June 18, 1982) to code each of 1,000 titles. The 1,000 titles were chosen from 50 catalogs of secondary school courses supplied by NCES. Twenty courses were chosen from each catalog by choosing a random starting point and then picking titles evenly spaced throughout the catalog. The twenty course titles from a catalog were listed on a protocol identifying the catalog and leaving spaces for the coders to indicate their coding decisions, whether they referred to the course description in the catalog, and their start and stop times. A sample protocol is shown as Exhibit 1. Thus each coder used the CSSC, 50 protocols containing 20 titles each, and the 50 catalogs. Coders were also permitted to use the reminder list of special instructions (see Appendix C) and the diagram "Making a Coding Decision" (see Appendix D) that were distributed and discussed during the training session. An end-of-study questionnaire was completed by each coder immediately after completing the coding of the last protocol.

### 2. Coding Procedures

All coders coded the 50 protocols in the same order. The sessions took place over an eight-day period, four days in one week and four days in the following week. A three-day weekend intervened. In order to reduce the need for two coders to use a single catalog at the same time, the coders started one hour apart on the first day. Each coder worked on one protocol at a time, entering the six-digit code for the title on the line next to the course title. When in doubt about a listed course title, the coder referred to the appropriate secondary school catalog and noted this reference with a check on the protocol sheet. The coders entered their start and stop times on the protocol and did not take breaks during the coding of a protocol. They were encouraged to take short breaks between

Coder No. _____ School: Kingston High School, North Carolina

Catalog No. 1 Time started: _____

| Course Name | Code | Reference to catalog |
|---|---|---|
| 1. Old Testament | 1. _____ | _____ |
| 2. Accounting 1 | 2. _____ | _____ |
| 3. English 10, Advanced | 3. _____ | _____ |
| 4. Literature Highlights | 4. _____ | _____ |
| 5. Modern American Literature | 5. _____ | _____ |
| 6. Crafts | 6. _____ | _____ |
| 7. Music Theory | 7. _____ | _____ |
| 8. Spanish 2 | 8. _____ | _____ |
| 9. Calculus | 9. _____ | _____ |
| 10. Archery | 10. _____ | _____ |
| 11. Soccer | 11. _____ | _____ |
| 12. Economy of Modern America | 12. _____ | _____ |
| 13. Salesmanship | 13. _____ | _____ |
| 14. Technical Drafting 1 | 14. _____ | _____ |
| 15. Auto Mechanics 2 | 15. _____ | _____ |
| 16. Business Law | 16. _____ | _____ |
| 17. Shorthand 1 | 17. _____ | _____ |
| 18. English 12, Advanced | 18. _____ | _____ |
| 19. Modern English Literature | 19. _____ | _____ |
| 20. Vocabulary Development | 20. _____ | _____ |

Time completed: _____

Exhibit 1. Typical Protocol

protocols. Coders were not allowed to discuss coding decisions until after the last coding session was complete. After completing each protocol, a coder handed it to the test monitor.

When a coder completed the fiftieth protocol, he or she was given the end-of-test questionnaire to complete. When all the coders were finished, a preliminary summary of the data was discussed with them and additional reactions were solicited in an informal debriefing session.

Because the coders were working very intensely and quickly, on the second coding day, the test monitor cautioned the coders to walk around between protocols in order to help themselves maintain a high rate of efficiency. When total output fell to seven protocols per day on the third day, the monitor told the coders that the breaks were becoming too long. The number of protocols per day increased although the average amount of time between starting and completing a protocol did not seem to be affected.

## III. RESULTS AND DISCUSSION

### A. CODING TIME

Coders were serious and attentive to the task and adhered to the constraint not to discuss the coding until after all coders had finished. Coders did not ask the monitor any questions about selecting the codes during the coding sessions. Because of the variations in the titling styles and the amount of descriptive material included in the catalogs from different schools, it was not possible for the three coders to maintain consistency of pace from protocol to protocol. The average time per protocol was 33 minutes with a minimum of ten minutes and a maximum of 55 minutes. The time each coder used to code each protocol is shown in Exhibit 2. By the end of the study, the coders were comfortably coding nine to ten protocols (180 to 200 titles) per day each.

### B. ACCURACY

Coder accuracy was determined by comparing each coder's responses on a sample of course titles to the correct classification for those titles as

| Protocol | Coder | | | Average |
|---|---|---|---|---|
| | 1 | 2 | 3 | |
| 01 | 22 | 28 | 27 | 25.7 |
| 02 | 35 | 49 | 35 | 39.7 |
| 03 | 36 | 53 | 38 | 42.3 |
| 04 | 38 | 48 | 50 | 45.3 |
| 05 | 48 | 71 | 44 | 54.3 |
| 06 | 28 | 46 | 29 | 34.3 |
| 07 | 35 | 39 | 61 | 45.0 |
| 08 | 40 | 40 | 30 | 36.7 |
| 09 | 32 | 35 | 25 | 30.7 |
| 10 | 37 | 40 | 55 | 44.0 |
| 11 | 40 | 25 | 25 | 30.0 |
| 12 | 51 | 50 | 30 | 43.7 |
| 13 | 35 | 38 | 35 | 36.0 |
| 14 | 20 | 16 | 15 | 17.0 |
| 15 | 34 | 24 | 30 | 29.3 |
| 16 | 27 | 30 | 20 | 25.7 |
| 17 | 41 | 53 | 40 | 44.7 |
| 18 | 45 | 52 | 45 | 47.3 |
| 19 | 37 | 35 | 32 | 34.7 |
| 20 | 49 | 50 | 30 | 43.0 |
| 21 | 36 | 25 | 13 | 24.7 |
| 22 | 26 | 33 | 30 | 29.7 |
| 23 | 39 | 35 | 30 | 34.7 |
| 24 | 29 | 42 | 25 | 32.0 |
| 25 | 31 | 35 | 25 | 30.3 |
| 26 | 37 | 22 | 60 | 39.7 |
| 27 | 23 | 15 | 13 | 17.0 |
| 28 | 31 | 30 | 25 | 28.7 |
| 29 | 24 | 25 | 20 | 23.0 |
| 30 | 48 | 42 | 30 | 40.0 |
| 31 | 21 | 10 | 30 | 20.3 |
| 32 | 23 | 35 | 40 | 32.7 |
| 33 | 32 | 26 | 35 | 31.0 |
| 34 | 39 | 32 | 35 | 35.3 |
| 35 | 50 | 29 | 20 | 33.0 |
| 36 | 43 | 27 | 30 | 33.3 |
| 37 | 21 | 20 | 20 | 20.3 |
| 38 | 25 | 33 | 25 | 27.7 |
| 39 | 17 | 22 | 25 | 21.3 |
| 40 | 22 | 23 | 20 | 21.7 |
| 41 | 27 | 40 | 15 | 27.3 |
| 42 | 62 | 30 | 55 | 49.0 |
| 43 | 44 | 15 | 20 | 26.3 |
| 44 | 17 | 25 | 20 | 20.7 |
| 45 | 20 | 27 | 15 | 20.7 |
| 46 | 31 | 25 | 20 | 25.3 |
| 47 | 35 | 52 | 52 | 46.3 |
| 48 | 55 | 40 | 25 | 40.0 |
| 49 | 38 | 30 | 25 | 31.0 |
| 50 | 35 | 25 | 30 | 30.0 |
| Average | 34.2 | 33.8 | 30.5 | 32.8 |

Exhibit 2. Time to Code Each Protocol by Coder in Minutes

determined by two CSSC experts. Fifty titles were chosen for the accuracy check by selecting one title from each of the fifty protocols. Titles were selected that do not correspond exactly to the titles in the CSSC index. This represents a more difficult set of coding decisions than those found on the average protocol, because protocols frequently have many titles that exactly match those in the index. The two expert coders classified the 50 titles independently and then met to resolve their differences.

The percent of agreement at the two-digit, four-digit, and six-digit code levels of each of the three coders with the correct code is shown in Exhibit 3.

Average agreement at the two-digit level was 83 percent; at the four-digit level was 71 percent, and at the six digit level was 43 percent. These percentages can be taken as lower bounds on the coders' accuracies since course titles that exactly correspond to CSSC titles should rarely be miscoded. If the coders had been allowed to discuss their decisions with each other, we would also expect the amount of agreement to be higher. The two expert coders had significant amounts of divergence at the four- and six-digit levels before conferring, although they had no difficulty in resolving their differences.

C. INTERCODER RELIABILITY

Intercoder reliability was measured on the first ten protocols (200 titles), the remaining protocols (800 titles), and overall (1000 titles). Two sets of measures were constructed:

- The percent of agreement between each of the three possible pairs of coders at the two-, four-, and six-digit code levels

- The percent of codes on which three, two, or no coders agreed at the two-, four-, and six-digit levels.

These measures are displayed in Exhibits 4 and 5. By all measures the agreement among the coders improves between the beginning of the study (the first 10 protocols) and the end of the study (the remaining protocols).

| Coder | Level | | |
|---|---|---|---|
| | 2-digit | 4-digit | 6-digit |
| 1 | 90 | 78 | 54 |
| 2 | 78 | 72 | 42 |
| 3 | 82 | 62 | 32 |
| Average | 83 | 71 | 43 |

Exhibit 3. Percent of Two-, Four-, and Six-Digit Code Levels on Which each Coder Agreed with Expert Code Assignments on 50 Hard Titles

| Coder Pair | Level | | |
|---|---|---|---|
| | 2-digit | 4-digit | 6-digit |
| Protocols 1-10 (200 Titles) | | | |
| Pair 1-2 | 91.5 | 86.5 | 72.5 |
| Pair 1-3 | 90.0 | 85.5 | 63.5 |
| Pair 2-3 | 88.5 | 82.5 | 63.0 |
| Protocols 11-50 (800 Titles) | | | |
| Pair 1-2 | 94.5 | 92.3 | 74.3 |
| Pair 1-3 | 94.0 | 89.0 | 71.3 |
| Pair 2-3 | 92.5 | 86.8 | 65.8 |
| Overall (1,000 Titles) | | | |
| Pair 1-2 | 93.9 | 91.1 | 73.9 |
| Pair 1-3 | 93.2 | 88.3 | 69.7 |
| Pair 2-3 | 91.7 | 85.9 | 65.2 |

Exhibit 4. Percent of Two-, Four-, and Six-Digit Code Levels on Which Each Pair of Coders Agree by Protocol Group and Overall

| Code Level | Number Agreeing | | |
|---|---|---|---|
| | 3 | 2 | 0 |
| Protocols 1-10 (200 Titles) | | | |
| 2-digit | 86.0 | 12.0 | 2.0 |
| 4-digit | 79.0 | 17.5 | 3.5 |
| 6-digit | 56.0 | 31.0 | 13.0 |
| Protocols 11-50 (800 Titles) | | | |
| 2-digit | 90.6 | 9.1 | 0.3 |
| 4-digit | 84.6 | 14.1 | 1.3 |
| 6-digit | 60.5 | 29.8 | 9.8 |
| Overall (1,000 Titles) | | | |
| 2-digit | 89.7 | 9.7 | 0.6 |
| 4-digit | 83.5 | 14.8 | 1.7 |
| 6-digit | 59.6 | 30.0 | 10.4 |

Exhibit 5. Percent of Two-, Four-, and Six-Digit Code Levels on Which Three, Two, and No Coders Agree by Protocol Group and Overall

As expected, the overall percentage of agreement among the pairs of coders is considerably higher than each coder's percentages in the accuracy check. The overall pair-wise average at the two-digit level is 92.9 percent. At the four-digit level, it is 88.4 percent. At the six-digit level, it is 69.6 percent.

As shown in Exhibit 5, all three coders agreed at the two-digit level 89.7 percent of the time, and two of the coders agreed 9.7 percent of the time. Either two or three coders agreed at the two-digit level 99.4 percent of the time. At the four-digit level, three coders agreed 83.5 percent of the time and two coders agreed 14.8 percent of the time. Either two or three coders agreed at the four-digit level 98.3 percent of the time. At the six-digit level, three coders agreed 59.6 percent of the time and two agreed 30 percent of the time. Either two or three coders agreed 89.6 percent of the time. Thus if the decisions of two out of three coders are accepted as satisfactory results of the coding task, agreement on a unique code can be expected approximately 90 percent of the time at the finest level of detail, 98 percent of the time at an intermediate level of detail, and 99 percent of the time at the instructional program area level (the two-digit code level).

## D. INSTRUCTIONAL PROGRAM AREA SUMMARIES

In order to determine whether specific areas of the CSSC are causing more problems for the coders than others, we tabulated for each instructional program area (two-digit level code) the number of times each area was selected as the classification for a title by all three coders, by two of the coders, and by only one of the coders. This information is tabled in Exhibit 6. The table distinguishes between the two ways that only one coder may select a code for a title:

- The other two coders agree with each other
- The other two coders disagree with each other.

| Code | Number of Coders Agreeing: Three | Two: Agreeing Pair | Two: Other Coder | None | Difficulty Index* | Number of Catalog References |
|---|---|---|---|---|---|---|
| 01 | 5 | 1 | 1 | 0 | 0.2000 | 10 |
| 02 | 4 | 1 | 3 | 0 | 0.7500 | 8 |
| 03 | 1 | 1 | 0 | 1 | 1.0000 | 6 |
| 04 | 1 | 1 | 0 | 0 | 0.0000 | 1 |
| 05 | 6 | 5 | 5 | 0 | 0.8333 | 17 |
| 06 | 18 | 1 | 1 | 1 | 0.1111 | 8 |
| 07 | 80 | 4 | 2 | 1 | 0.0375 | 61 |
| 08 | 9 | 0 | 2 | 0 | 0.2222 | 14 |
| 09 | 20 | 1 | 1 | 0 | 0.0500 | 25 |
| 10 | 6 | 1 | 2 | 0 | 0.3333 | 10 |
| 11 | 11 | 1 | 0 | 0 | 0.0000 | 7 |
| 12 | 1 | 1 | 0 | 0 | 0.0000 | 2 |
| 13 | 0 | 0 | 0 | 0 | 0.0000 | 0 |
| 14 | 0 | 0 | 0 | 0 | 0.0000 | 0 |
| 15 | 0 | 0 | 0 | 0 | 0.0000 | 0 |
| 16 | 75 | 2 | 0 | 0 | 0.0000 | 35 |
| 17 | 6 | 0 | 1 | 0 | 0.1667 | 12 |
| 18 | 0 | 0 | 0 | 0 | 0.0000 | 0 |
| 19 | 0 | 0 | 0 | 0 | 0.0000 | 0 |
| 20 | 60 | 4 | 3 | 0 | 0.0500 | 99 |
| 21 | 22 | 1 | 2 | 0 | 0.0909 | 23 |
| 22 | 3 | 2 | 0 | 0 | 0.0000 | 11 |
| 23 | 111 | 14 | 6 | 0 | 0.0541 | 188 |
| 24 | 1 | 0 | 0 | 0 | 0.0000 | 0 |
| 25 | 1 | 0 | 1 | 0 | 1.0000 | 1 |
| 26 | 25 | 2 | 1 | 2 | 0.1200 | 25 |
| 27 | 92 | 2 | 1 | 0 | 0.0109 | 96 |
| 28 | 2 | 0 | 1 | 0 | 0.5000 | 1 |
| 29 | 0 | 0 | 0 | 0 | 0.0000 | 0 |
| 30 | 2 | 2 | 8 | 4 | 6.0000 | 14 |
| 31 | 0 | 0 | 1 | 1 | 2.0000 | 1 |
| 32 | 17 | 5 | 13 | 1 | 0.8235 | 45 |
| 33 | 6 | 1 | 2 | 0 | 0.3333 | 12 |
| 34 | 16 | 5 | 7 | 2 | 0.5625 | 29 |
| 35 | 0 | 2 | 2 | 0 | 2.0000 | 6 |
| 36 | 2 | 8 | 4 | 1 | 2.5000 | 16 |
| 37 | 0 | 1 | 3 | 0 | 3.0000 | 5 |
| 38 | 9 | 1 | 1 | 0 | 0.1111 | 28 |
| 39 | 0 | 0 | 0 | 0 | 0.0000 | 0 |
| 40 | 35 | 3 | 5 | 2 | 0.2000 | 35 |
| 41 | 0 | 0 | 0 | 0 | 0.0000 | 0 |
| 42 | 3 | 0 | 1 | 0 | 0.3333 | 2 |
| 43 | 0 | 0 | 0 | 0 | 0.0000 | 0 |
| 44 | 0 | 0 | 1 | 0 | 1.0000 | 1 |
| 45 | 54 | 8 | 7 | 2 | 0.1667 | 104 |
| 46 | 5 | 2 | 0 | 0 | 0.0000 | 9 |
| 47 | 17 | 0 | 0 | 0 | 0.0000 | 23 |
| 48 | 47 | 3 | 5 | 0 | 0.1064 | 41 |
| 49 | 2 | 0 | 0 | 0 | 0.0000 | 0 |
| 50 | 122 | 8 | 4 | 0 | 0.0328 | 160 |
| Total | 897 | 97 | 97 | 18 | 0.1282 | 1,191 |

$$*\text{Index} = \frac{\text{Number in "Other Coder" Column and Number in "None" Column}}{\text{Number in "Three" Column}}$$

If "Three" Column has a zero, 1 is used in the denominator.

Exhibit 6. Number of Classifications on which Three, Two & No Raters Agree and The Difficulty Index and the Number of Catalog References by Two-Digit Code Level (Instructional Program Area)

As a measure of the coding difficulty of each instructional program area, we computed a difficulty index for each instructional area by dividing the number of times specific titles were assigned to an instructional area by a single coder by the number of times specific titles were assigned to that area by all three coders. To prevent division by zero, the divisor was arbitrarily set to one if the instructional area was never chosen unanimously. This difficulty index is included in the sixth column of the table. Exhibit 6 also displays the number of times the coders referred to the catalogs for titles in each area. Since the number of titles in each instructional area varied widely, the individual counts are of limited utility. The total of 1191, however, represents almost 40 percent of the 3000 coding decisions made by the three coders, indicating that the coders made substantial use of the catalogs.

There are eight instructional areas with a difficulty index of 1 or greater:

| Area Code | Area Description |
|---|---|
| 03 | Renewable Natural Resources |
| 25 | Library and Archival Sciences |
| 30 | Multi/Interdisciplinary Studies |
| 31 | Parks and Recreation |
| 35 | Interpersonal Skills |
| 36 | Leisure and Recreational Activities |
| 37 | Personal Awareness |
| 44 | Public Affairs |

These accounted for seven percent of the titles coded. They appear to have been chosen for courses that simply did not fit well elsewhere. Their high variability is associated with their low frequency of occurrence.

Nine instructional areas had indices of zero because they were never selected:

| Area Code | Area Description |
|---|---|
| 13 | Education |
| 14 | Engineering |
| 15 | Engineering and Engineering-Related Technologies |
| 18 | Health Sciences |
| 19 | Home Economics |
| 29 | Military Technologies |
| 39 | Theology |
| 41 | Science Technologies |
| 43 | Protective Services |

Most of these are clearly too advanced for most secondary school curricula.

There were another nine instructional areas with indices of zero. In each of these cases two or three of the coders chose the same two-digit code and there was never a case of total disagreement:

| Area Code | Area Description |
|---|---|
| 04 | Architecture and Environmental Design |
| 11 | Computer and Information Sciences |
| 12 | Consumer, Personal, and Miscellaneous Services |
| 16 | Foreign Languages |
| 22 | Law |
| 24 | Liberal/General Studies |
| 46 | Construction Trades |
| 47 | Mechanics and Repairers |
| 49 | Transportation and Material Moving |

Of these nine areas, only areas 11, 16, and 47 were chosen more than 20 times.

There were seven areas with indices between zero and 0.1 indicates that the coders had very little disagreement. These areas are:

| Area Code | Area Description |
|---|---|
| 07 | Business and Office |
| 09 | Communications |
| 20 | Vocational Home Economics |
| 21 | Industrial Arts |
| 23 | Letters |
| 27 | Mathematics |
| 50 | Visual and Performing Arts |
| 47 | Mechanics and Repairers |
| 49 | Transportation and Material Moving |

Each of these areas was chosen between 62 and 386 times.

E. RESPONSE VARIATION

There appeared to be at least seven different reasons for variation in coder response.

1. Level Assignment. Although coders agreed at the four-digit level, they varied in interpretation of the level at the fifth and sixth digit level. For example, Protocol 2, title 17, "Economics." The codes assigned were 45.0602 Economics and Economic Problems; 45.0601 Economic Theory, Basic; 45.0611 Economics, College.

A similar situation occurred in Protocol 3, title 12, "Environmental Biology" and Protocol 4, title 10, "Practical Math." This source of variation could be ameliorated by developing guideline sheets giving information that distinguishes among levels. Increased emphasis in the training should be placed on reviewing differences between levels.

2. Vague Secondary School Course Titles. Some secondary school courses had vague titles; for example, "Literary Highlights." The course descrip-

tion included both British and American literature. Since no code was available for an all-inclusive course, coders agreed at the two-digit "Letters" level, but varied at the four- and six-digit levels. A similar situation occurred at Protocol 4, title 7, "Executive High School Intern."

Such courses will invariably be included in student data. The CSSC could not disaggregate every imaginable course combination. In this situation the coders can only place courses to the best of their judgment, referring to the school catalogs and the keywords in the CSSC.

3. Generic Titles. In some instances, the CSSC uses the generic title, for example, "Aquatics" instead of a specific form of acquatics such as "Skin Diving." Protocol 38, title 16, listed the course title "Skin Diving." Coders placed it under 34.0161 "Physical Education Leadership Training", 36.0161 "Aquatics" and 31.0200 "Outdoor Recreation, Other."

Coders need to be trained to search for generic titles when the specific course title is not listed. A cross reference list for such generic titles could be added to the general list of cross references.

4. Combined Concepts. Several courses combine concepts from two different programs. It is difficult to know whether to place the course under the traditional heading (e.g., History) or in newly developed program areas such as area studies or in multi/interdisciplinary studies. This conflict is reflected in Protocol 13, title 13 "History and Philosophy of Sciences" which was variously placed in 30.0411 Humanities, 45.0311 Archaeology, 40.0100 Physical Sciences, Other. Similarly, Protocol 6, title 14 "General Science" was placed in 26.0611 Ecology, 30.0111 Science, Unified, and 26.0151 Field Biology. In the same manner Protocol 10, title 1 "American Studies" was placed in 45.0809 American History, Basic, 05.0103 American Studies, General, and 45.0822 American Inquiries. Finally in Protocol 10, title 4 "Technology and Environment" was placed in 30.0621 Environmental Science, 03.0211 Conservation and Regulation, and 45.1131 Sociology, Issues. The Cross Reference List should be expanded to include references to courses of combined concepts.

5. Differences between Programs. In some cases, courses were placed according to a course title that was listed but in a program that was not appropriate. For example Protocol 3, title 15 "Cooperative Office Management" was placed in 07.0742 Office Education 2, Cooperative; 07.0741 Office Education 1, Cooperative; 32.0107 Cooperative Education 2. The 07 is the Business Program Category and the 32 is Basic Skills under "Personal and Social Development" Program Category. In a similar way, Protocol 5, title 5, "World Civilization" is listed both under 45.08 History and 30.04 Humanities and Social Sciences by different coders.

To limit this source of variation, the definition of the areas, particularly 07 and 32 needs to be reemphasized for coders.

6. Unclear Course Objectives. Some catalogs list a course as "Drama" and do not clarify whether the course is the reading of drama, the writing of plays, or the acting of dramatic literature. An example of this is found in Protocol 6, title 8, "Beginning Drama". This course was coded both as 23.01, reading of drama and 50.05, acting of drama. Further clarification and separation between program areas at the four-digit level should be made. That may be beyond the scope of the CSSC and more directly related to the problems of definition within disciplines as well as secondary school curriculum.

7. Low Frequency Course Titles. Occasionally a course will appear that is unfamiliar to the coders and does not appear in the index. This will be the case for highly innovative and unusual secondary school courses that do not fit traiditional categories well. For example, Protocol 6, title 17, "Peer Counseling" was coded both in 42.06 Counseling Psychology and 33.01 Citizenship/Civic Activities. This source of variation is inherent in the variability of secondary school offerings and cannot readily be eliminated.

## IV. CONCLUSIONS AND RECOMMENDATIONS

The basic use of the CSSC can be easily taught to inexperienced coders in a one-day training session. The coders can then proceed to code course titles at the rate of approximately 1.5 minutes per title.

While there is a fair amount of variability in the coding there are a number of straight-forward ways to reduce it and achieve nearly perfect codings. Some of these techniques involve training enhancements and some involve procedural approaches.

A. TRAINING ENHANCEMENTS

1. Place Additional Emphasis on the Content of the Instructional Areas. The training as presented is adequate for coders with the backgrounds of those used in this study. Because we hired them on a temporary basis during the summer, we were able to find school teachers to do the coding. This may not be the case for a long term coding project that takes place during the academic year. Since non-teachers will be less familiar with content of the various instructional areas, it would be wise to place additional emphasis in the training on the content of the major instructional areas.

2. Expand the Cross-Reference List. As noted in the discussion, a number of sources of variation could be counteracted by developing an expanded Cross-Reference List to include references to generic titles and courses with combined concepts.

3. Increase Instruction on Determing Levels. Much of the variation noted resulted from disagreements among the coders on the choice of the fifth and sixth digit for courses with multiple level options. More detailed guidelines should be developed for determining levels. Practice on using these guidelines should be included in the training.

B. PROCEDURAL APPROACHES

1. Using Multiple Coders. Having two or three coders code the same material will result in a high degree of unique codings. Differences can then be resolved through discussions among the coders. Our experience suggests that trained coders will have little difficulty resolving their differences. Exhibit 4 indicates that two coders will agree at the six-digit level about 70 percent of the time, leaving about 30 percent of the titles to be resolved through discussion.

Exhibit 5 shows that two or three out of three coders will agree at the six-digit level approximately 90 percent of the time. Only the ten percent of the titles that all three coders disagreed on would need to be discussed.

Presumably regular discussions among the coders would reduce future variation in the coding decisions. At the very least, multiple codings with discussion of differences should be used for the first few weeks after the initial training. When to stop multiple coding should be a function of the level of agreement among the coders.

2. Let Coders Talk to Each Other and to an Expert. For the intercoder reliability study we insisted that all coding decisions be independent. This requirement would be counterproductive for a full-scale coding effort and should be dropped. Some permanent staff member should be designated to become the resident expert to whom the temporary coders can turn to for guidance in resolving difficult cases.

# APPENDIX A

# TRAINING OUTLINE

CLASSIFICATION OF SECONDARY SCHOOL COURSES
CODER TRAINING, RELIABILITY TEST, AND DATA ANALYSIS PLANS

## I. TRAINING PLAN

### Training Program Goal

As a result of an eight hour training session, four trainees will be prepared to assign six-digit codes to secondary course titles in order to provide data for a reliability test of the Classification of Secondary School Courses (CSSC).

### Training Objectives

As a result of training, the trainees will be able to:

- Describe the purpose of the coding task
- Identify the different sections of the CSSC
- Identify the various parts of the course title unit for a course in the CSSC
- Follow proper coding procedures in matching course titles listed on prepared protocols with related six-digit codes from the CSSC.

### Required Materials

- Training outline detailing training content and training approach
- Six copies of the completed CSSC
- Six copies of training protocols containing sample course titles for practice coding

- Six copies of coder reminder list of special instructions
- Six copies of the diagram "Making a Coding Decision."

Training Agenda

A. Introduction to Training and Test (30 min.)

1. Review format for the training session, working hours, time sheets, physical arrangements, etc. for the period of employment.
2. Summarize all participants' backgrounds and roles to establish an environment of mutual understanding.
3. Describe the CSSC and its intended use in the NCES High School and Beyond longitudinal study.
4. Outline the coding task and the purpose of the reliability test.

B. Present the CSSC (30 min.)

1. Highlight main points from the CSSC introduction.
2. Describe, using examples, the layout of the main body of the CSSC.
3. Explain the alphabetical index, using examples, and demonstrate how it relates to the main body of the CSSC.
4. Explain the use of the List of Instructional Program Categories and the table of Cross References.

C. Break (15 min.)

D. Describe the Coding Task (2 hours 15 min.)

1. Inspect a sample protocol identifying: space for six-digit code; space for indicating if reference was made to catalog; spaces to record start/finish times.

2. Explain use of local catalogs, with examples, describing relationship of catalogs to protocols and use of catalogs as backup to coding decisions.

3. Outline coding approach, using examples and the diagram of a coding decision. Coders should be instructed to:

   - Code every course title on protocol sheets with a full six-digit code
   - Allow adequate time for each coding decision, as speed is not to be emphasized over accuracy of coding
   - Use the "other" category only after making a thorough search of the taxonomy for coding alternatives
   - Code all bilingual, special education, or gifted course titles as if they were regular versions of the courses.

4. Describe the coding procedure. Coders should be instructed to:

   - Record start/finish times of each protocol
   - Maintain the order of the protocols
   - Ask questions of the test monitor at any time
   - Refrain from discussing coding decisions among themselves to avoid biasing the test results

- Complete the protocol they are working on before taking breaks or leaving for the day.

5. Provide coders with guidelines for coding "tracked" and "leveled" courses.

   In coding "tracked" courses, i.e., courses labeled with designators such as "Remedial," "Below Grade Level," "Standard," "College," "Honors," etc., coders should be instructed to follow these guidelines:

   - If the course title to be coded is designated as a track, and the CSSC course title is not divided into tracks, do not use the track information in coding the course

   - If the course title to be coded is not tracked, and the CSSC course is divided into tracks, code the course with the standard or middle track course code.

   In coding "leveled" courses, i.e. courses labeled with designators such as "First Year," "Advanced," or with numbers such as "Drafting 5," coders should be instructed to follow these guidelines:

   - If the course title to be coded has no level designator, and the CSSC includes only leveled courses, code the course with the ninth grade or level 1 course code

   - If the course title to be coded has a level designator, and the CSSC course is not leveled, do not use the level designator in coding the course

   - If the course title to be coded has a level designator higher than the level used in the CSSC, code the title with the highest CSSC level course code available.

6. Demonstrate the coding tasks using several examples listed on a demonstration protocol.

E. Break (1 hour)

F. Conduct Coding Practice Trials (4 hours)

1. Four coders independently match ten sample course titles presented on a trial protocol with six-digit codes from the CSSC and record their decisions. The ten coding decision are then discussed as a group.

2. The coding practice task is repeated with a second more difficult trail protocol of ten course titles. The coding results are discussed as a group.

3. The need for more practice is determined, and, if necessary, a third trial protocol is employed for additional practice.

G. Conclude Training

1. Provide instructions for beginning the reliability test on the following morning.

# APPENDIX B

# PRACTICE PROTOCOLS

Coder No. _____

Catalog No. 51

School: Springfield Public Schools

Time started: _____

| Course Name | Code | Reference to catalog |
|---|---|---|
| 1. Sculpture | 1. | |
| 2. Accounting 235 | 2. | |
| 3. Home Economics Occupations 434 | 3. | |
| 4. Industrial English | 4. | |
| 5. Language | 5. | |
| 6. Smart Spending | 6. | |
| 7. Mixed Choir 334 | 7. | |
| 8. Special Chemistry | 8. | |
| 9. Religions of the World | 9. | |
| 10. Child Care | 10. | |
| 11. | 11. | |
| 12. | 12. | |
| 13. | 13. | |
| 14. | 14. | |
| 15. | 15. | |
| 16. | 16. | |
| 17. | 17. | |
| 18. | 18. | |
| 19. | 19. | |
| 20. | 20. | |

Time completed: _____

Coder No. _____

School: North H.S. Omaha, Neb.

Catalog No. Practice #1
(cat Old #49)

Time started: _____

| Course Name | Code | Reference to catalog |
|---|---|---|
| 1. Beginning Journalism | 1. | |
| 2. Survey of Black Literature | 2. | |
| 3. Math Analysis | 3. | |
| 4. American Government 1 | 4. | |
| 5. Office Procedures | 5. | |
| 6. Foods and Nutrition | 6. | |
| 7. Agribusiness I | 7. | |
| 8. Electronic Music | 8. | |
| 9. Gym Aide | 9. | |
| 10. Drivers Education | 10. | |
| 11. | 11. | |
| 12. | 12. | |
| 13. | 13. | |
| 14. | 14. | |
| 15. | 15. | |
| 16. | 16. | |
| 17. | 17. | |
| 18. | 18. | |
| 19. | 19. | |
| 20. | 20. | |

Time completed: _____

Coder No. _____

Catalog No. Practice #2

School: Springfield Public Schools, Illinois

Time started: _____

| Course Name | Code | Reference to catalog |
|---|---|---|
| 1. Drawing | 1. | |
| 2. Creative Writing | 2. | |
| 3. Drama/Play Production | 3. | |
| 4. Perspective France | 4. | |
| 5. Interior Decorating | 5. | |
| 6. Small Engine Repair | 6. | |
| 7. College Algebra | 7. | |
| 8. Beginning Guitar | 8. | |
| 9. Environmental Science I | 9. | |
| 10. Consumer Education | 10. | |
| 11. | 11. | |
| 12. | 12. | |
| 13. | 13. | |
| 14. | 14. | |
| 15. | 15. | |
| 16. | 16. | |
| 17. | 17. | |
| 18. | 18. | |
| 19. | 19. | |
| 20. | 20. | |

Time completed: _____

Coder No. _____

Catalog No. Practice #3

(Cat New #12)

School: Kennedy SHS Bloomington Minn.

Time started: _____

| | Course Name | Code | Reference to catalog |
|---|---|---|---|
| 1. | Personal Analysis | 1. | |
| 2. | Aviation/Aerospace A | 2. | |
| 3. | Photo Offset | 3. | |
| 4. | Norwegian, Conversational 1 | 4. | |
| 5. | Chemistry, Organic | 5. | |
| 6. | Minnesota Environment | 6. | |
| 7. | International Relations | 7. | |
| 8. | Sales and Marketing, Basic | 8. | |
| 9. | AudioVisual Technology | 9. | |
| 10. | Horse Care and Stable Operations | 10. | |
| 11. | | 11. | |
| 12. | | 12. | |
| 13. | | 13. | |
| 14. | | 14. | |
| 15. | | 15. | |
| 16. | | 16. | |
| 17. | | 17. | |
| 18. | | 18. | |
| 19. | | 19. | |
| 20. | | 20. | |

Time completed: _____

APPENDIX C

CODER INFORMATION SHEETS

THINGS TO REMEMBER

1. Code the protocols in order from one to fifty. Make sure not to skip any course titles.

2. Work at a steady pace. Do not feel you have to rush. Be accurate in your coding decisions.

3. Complete the protocol you are working on before taking a break or leaving for the day.

4. Write all code numbers carefully and clearly on the lines provided.

5. Do not discuss the coding decisions you have made with other coders.

6. You can read course descriptions in high school catalogs for any titles you are not sure of. Remember to mark the protocol each time you refer to a catalog.

7. Record the start/finish times for each protocol.

8. Follow the steps outlined in the diagram "Making a coding decision" until you get familiar with the coding procedure.

9. Use the "other" code "00" only after carefully searching for a more specific code.

10. It may seem to you at times that more than one code could be given to a single course title. Decide which code is the "best" choice, using the local catalog course descriptions, the location of the course within the school catalog, and the keywords and alternate titles in the CSSC as guides.

11. Ask for general advice from the test monitor. However, he/she cannot give you specific recommendations for which codes to use.

## CODING "TRACKED" AND "LEVELED COURSES

In coding "tracked" courses, i.e., courses labeled with designators such as "Remedial," "Below Grade Level," "Standard," "College," "Honors," etc., coders should follow these guidelines:

- If the course title to be coded is designated as a track, and the CSSC course title is not divided into tracks, do not use the track information in coding the course.

- If the course title to be coded is not tracked, and the CSSC course is divided into tracks, code the course with the standard or middle track course code.

In coding "leveled" courses, i.e., courses labeled with designators such as "First Year," "Advanced," or with numbers such as "Drafting 5," coders should follow these guidelines:

- If the course title to be coded has no level designator, and the CCSC includes only leveled courses, code the course with the ninth grade or level 1 course code.

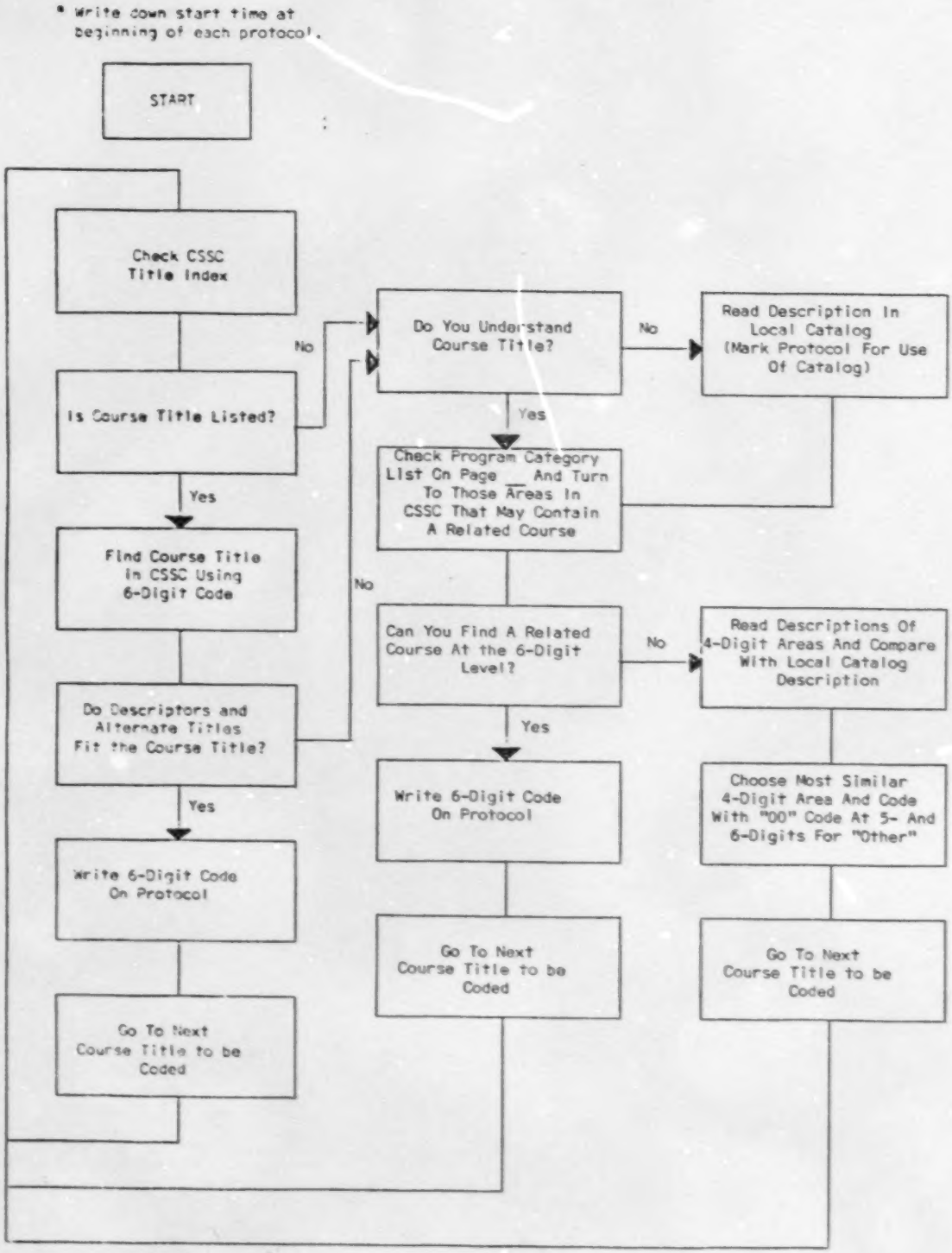
- If the course title to be coded has a level designator, and the CSSC course is not leveled, do not use the level designator in coding the course.

- If the course title to be coded has a level designator higher than the level used in the CSSC, code the title with the highest level course code available in the CSSC.

# APPENDIX D

# MAKING CODING DECISION

MAKING A CODING DECISION


* Write down start time at beginning of each protocol.
START
Check CSSC Title Index
Is Course Title Listed?
No
Yes
Find Course Title in CSSC Using 6-Digit Code
Do Descriptors and Alternate Titles Fit the Course Title?
No
Yes
Write 6-Digit Code On Protocol
Go To Next Course Title to be Coded
Do You Understand Course Title?
No
Yes
Read Description In Local Catalog (Mark Protocol For Use Of Catalog)
Check Program Category List On Page __ And Turn To Those Areas In CSSC That May Contain A Related Course
Can You Find A Related Course At the 6-Digit Level?
No
Yes
Write 6-Digit Code On Protocol
Go To Next Course Title to be Coded
Read Descriptions Of 4-Digit Areas And Compare With Local Catalog Description
Choose Most Similar 4-Digit Area And Code With "00" Code At 5- And 6-Digits For "Other"
Go To Next Course Title to be Coded

* Write down completion time at end of protocol.

* Check to make sure you have marked local catalog use.

# APPENDIX E

## RESPONSES TO CODER FEEDBACK QUESTIONNAIRE

4. What would you like to see added to the training?

Training sufficient.

Explanations and examples clear.

A little more comparative work so you wouldn't feel so unsure about coding at very beginning.

N.A.

5. What would you like to see removed from the training?

Nothing.

6. What other changes would you suggest for the training?

None.

Researching protocols in morning only. Variation of work during breaks. More training on cross-referencing and alternative titles with groups not as academically prepared.

7. Were the individual course descriptions in the CSSC sufficiently detailed?

____ Always

_4_ Most of the time

____ About half the time

____ Seldom

____ Never

8. What three two-digit instructional program areas do you feel are the hardest to use? (You may refer to your CSSC when answering this question.)

   03, 09, 20, 22 (not enough detail), 23, 26, 38 (not enough detail), 45, and 46-49 (unfamiliar category).

9. What parts of these areas caused the most problems?

   Courses very similar. Vague descriptions of school courses. Descriptions too complete or incomplete. Uncertainty in choosing an answer.

   40.0711, 09.0400, 09.0442 and 20.0122-25.

10. Please provide us with any other suggested improvements in the CSSC.

    Bilingual classes in specific disciplines listed. Special Education courses might be developed. Let people work at own pace to assure accuracy. Fixed payment on completion of project.

11. Please sum up in your own words your reactions to the CSSC and this experiment.

    Coder 1. CSSC seems to be a very useful, and more often than not, a precise coding tool. Aside from the areas previously mentioned, the secondary school courses from our protocols were readily classified.

    Consideration might be given to the fact that different coders have (will have) different paces and will be able to accomplish the job more quickly (slowly) than others. Perhaps a payment (lump sum) for the task completed would be an efficient way of allocating resources.

The coding task is tedious and breaks are important. Perhaps morning work, or evening work (part time) would be one way of avoiding worker fatigue, and consequently, accuracy (sic).

I made use of the school catalogs often.

Coder 2. I can see a need for a classification system such as this nationally. I hope this document meets the goals you expected.

Coder 3. Can be tedious at times and interesting at times also. An experience definitely.

Coder 4. The CSSC does accomplish what it is designed to do. That is, to provide the user with a manual which standardizes academic and vocational courses in a comprehensive way.